Vehicle Steering Wheel

Technical Field

The invention relates to a vehicle steering wheel.

Background of the Invention

During driving, vibrations of the steering wheel can occur, which makes long journeys exhausting for the driver and impairs the steering sensation. Therefore, endeavors are being made to dampen the steering wheel with respect to the steering shaft or, for example, to fasten the gas bag module in an oscillating manner in the steering wheel hub.

From DE 20 13 795 B2, for example, there is known a steering wheel which has a steering wheel hub, a steering wheel rim and two spokes consisting of spoke sections. Ball joints including damping elements are each provided between the spoke sections themselves, as well as at the transition points of the spoke to the steering wheel rim and to the steering wheel hub, respectively. The spoke structure disclosed here must have a specific rigidity, so that one can not start out from an isolation of vibrations in a radial and/or circumferential direction. The spoke structure shown in this reference rather aims to provide for a defined resilience of the steering wheel rim in the direction of the steering axis upon impact of a vehicle driver.

Brief Summary of the Invention

The invention provides a vehicle steering wheel which with a simple construction offers a high degree of driving comfort owing to a small tendency to vibration. This is achieved in a vehicle steering wheel which comprises a hub, a steering wheel rim, and at least one spoke having at least one spoke section. An vibration-decoupling means is provided on the spoke which acts in all directions and at least largely isolates the steering wheel rim in terms of vibrations in all

directions from the at least one section of the spoke. In the vehicle steering wheel proposed, there is provided an vibration-decoupling means between the steering wheel hub and the steering wheel rim, i.e. either inside the spoke or at the transition point of the spoke to the steering wheel rim, so that the steering wheel rim vibrates at least less than in steering wheels known hitherto.

The vibration-decoupling means is formed by an elastic bearing, as provided by the preferred embodiment, the bearing being, for example, a composite bearing. It consists of several parts, some of which are so elastic that they do not transfer vibrations, which occur for example in the region of the steering wheel hub or the steering shaft, to the steering wheel rim. An immediate contact between adjacent rigid parts of the steering wheel in the region of the vibration-decoupling means is avoided as the forces in all directions are transferred via the elastic bearing.

The spoke and/or the steering wheel rim can have a foam casing which is part of the bearing, so that the bearing can be constructed at a favorable cost and is produced at least partially during the process of encasing with foam.

An embodiment of the invention makes provision that the bearing has a pin and a receiving shell (e.g. a bush) for the pin, between which an elastic equalizing element is arranged. The steering wheel rim preferably has, as a supplement to this, a skeleton ring, the pin or the receiving shell being fastened to the skeleton ring and the spoke having the respective counterpart, i.e. the receiving shell or the pin.

In order to bring the pin into the receiving shell on installation, for example the spoke is constructed to be so flexible that on installation the pin can engage axially into the mounting bush.

Another possibility of connection of the parts separated from each other by the vibration-decoupling means consists in dividing the spoke into spoke sections which overlap to create a fastening flange. For example, the vibration-decoupling means can be provided in the region of the fastening flange. Furthermore, the

spoke sections can also make possible the introduction of the pin into the receiving shell, because usually the steering wheel rim is undivided, so that a radial joining of radial inner sections of the steering wheel into radially outer sections is only possible with increased structural expenditure.

A further embodiment makes provision that the spoke is divided into separate spoke sections which are connected with each other by a bearing surrounding the spoke sections and defines said vibration-decoupling means. The bearing surrounds the spoke sections like a sleeve and arrests them against each other such that on the one hand the steering forces are in fact transferred, but on the other hand an isolation of vibrations is achieved in a defined frequency range.

The connecting of the spoke with the steering wheel rim, which is as far as possible undivided, can take place for example in that the steering wheel rim is equipped with a skeleton ring having radially inwardly protruding projections of sheet metal which projections are bent such that they engage an end of the spoke facing the skeleton ring. This type of fastening is very simple and cheap to produce.

Brief Description of the Drawings

Figure 1 shows a top view onto an embodiment of the steering wheel according to the invention,

Figure 2 shows an enlarged view of the region, designated by X in Figure 1, partially in section,

Figure 3 shows a sectional view in the region of the transition point of the spoke to the steering wheel rim according to a second embodiment,

Figure 4 shows a sectional view in the region of the transition point of the spoke to the steering wheel rim according to a third embodiment,

Figure 5 shows a sectional view in the region of the transition point of the spoke to the steering wheel rim according to a fourth embodiment,

Figure 6 shows a sectional view in the region of the transition point of the spoke to the steering wheel rim according to a fifth embodiment,

Figures 7 and 8 show diagrammatic illustrations of various phases of installation of the steering wheel according to the invention,

Figure 9 shows a sectional view through a sixth embodiment of the steering wheel according to the invention,

Figure 10 shows a sectional view in the region of the transition point of the spoke to the steering wheel rim according to a seventh embodiment and

Figure 11 shows a cross-sectional view along the line XI-XI in Figure 10.

Detailed Description of the Preferred Embodiments

In Figure 1 a vehicle steering wheel is illustrated, which has a hub 3, a steering wheel rim 5 and four spokes 7. A horn switch area is designated by 9 and multifunction switches are designated by 11. Each spoke 7 is divided into an outer and a radially inner spoke section 13 and 17, respectively, in order to largely isolate the steering wheel rim 5 relative to the hub 3 with regard to vibrations. For this, in each spoke 7 an vibration-decoupling means is provided in the region of the transition point of the spoke sections 13, 17, which can be better seen in Figure 2. The inner spoke section 17 has a pin 19, which is inserted into a composite bearing 21, which sits in an opening in the outer spoke section 13. The composite bearing 21 is composed of several elastic rings which achieve an isolation of vibrations of the steering wheel rim 5 with outer spoke section 13 fastened thereto from the inner spoke section 17 together with hub 3. The vibration-decoupling means acts in all directions (which is also the case in all further embodiments explained hereinafter), inter alia in the radial, axial and circumferential directions.

The composite bearing 21 forms an elastic equalizing element and the outer spoke section 13 forms a receiving shell for the pin 19 and the bearing 21.

Figure 3 shows the interior of the steering wheel rim, in which a skeleton ring 23 is provided, which is surrounded by a PU foam casing 25. In the region of the transition point to the spokes 7, the foam casing of which spokes being not illustrated explicitly, a receiving shell 27 is fastened to the skeleton ring 23, e.g. by welding; however, it can also be cast on. The receiving shell 27 is also encased in foam, the foam casing 25 also being provided in the interior 29 of the shell 27. In this region, the foam casing replaces the composite bearing 21 in Figure 2 and forms the elastic equalizing element into which the pin 19 of the spoke 7 projects. The isolation of vibrations is consequently formed in this embodiment by the receiving shell 27, the PU foam casing 25 in the region of the interior 29 of the receiving shell 27 and by the bearing pin 19. The isolation takes place here between the steering wheel rim 5 and the entire spoke 7.

In the embodiment according to Figure 4, the bearing shell 27' is cast on to the skeleton ring 23. The elastic equalizing element in the interior of the receiving shell 27' is formed by an inserted elastic bush 21', into which the pin 19 projects. In the embodiment according to Figure 4, a subdivision of the spoke 7 is no longer to be seen from the exterior; rather, the vibration-decoupling means is arranged at the transition point of the spoke to the steering wheel rim, so that only the steering wheel rim is isolated in terms of vibrations.

In the embodiment according to Figure 5, a cup-shaped bush 21" made by injection-molding is inserted into the steering wheel rim 5, in order to achieve the isolation of vibrations.

In the embodiment according to Figure 6, each spoke 7 is divided into two spoke sections 13, 17 which have already been explained, the spoke skeleton also consisting of two sections 33, 37, which are encased in foam. The foam casing is designated by 39. The skeleton sections 33, 37 are surrounded by an elastic bearing 41, consisting a metal sleeve 40 and ring-shaped elastical bearing sections 43, 45 arranged in the sleeve 40, in order to achieve a connection of the spoke sections 13, 17 with regard to forces with, at the same time, an isolation of vibrations.

As the spokes are usually connected in one piece with the hub, steps must be taken to be able to insert the pins 19 into the corresponding bearings.

In the embodiment according to Figures 7 and 8, the skeleton section of hub 3 and spokes 7 consists of sheet metal. The steering wheel rim 5 has a receiving shell, not illustrated in further detail, which is characterized by an opening 71. At the start of installation (Figure 7), the upper end 73 of the spoke 7 stands obliquely outwards and upwards, so that it does not project, or only projects slightly, into the opening 71. Through axial displacement of the steering wheel rim 5 in the arrow direction, with a simultaneous holding of the hub 3, the spokes 7 are pressed downwards and are deformed plastically, the radially outer upper end 73 likewise being bent and travelling outwards into the opening 71. Figure 8 then shows the finished joined state. In this state, for example, the sheet metal skeleton of the spokes 7 can be encased in foam.

In the embodiment according to Figure 9, this is achieved for example in that the spoke sections 13, 17 each have fastening flanges 51, 53 which overlap each other. In the region of the fastening flanges 51, 53, the spoke sections 13, 17 are screwed with each other. The spoke section 13 is inserted into a receiving shell, not illustrated here in further detail, in the steering wheel rim 5.

In the embodiment according to Figures 10 and 11, the steering wheel rim has a skeleton ring 81 of sheet metal having two opposing radially inwardly protruding projections. The upper projection 83 of the skeleton ring 81 is bent upwards before the start of assembling the steering wheel, as shown in Figure 10. Thereby, the hub together with the spokes 7, the pins 19 and the elastic bearings 21 placed onto the pins 19 can be inserted into the skeleton ring 81. Then the upper projection 83 is bent downwards in the arrow direction and presses onto the bearing 21, so that the latter, as shown in Figure 11, engaged by the projections and attached to the skeleton ring 81. A slit 85 is arranged between the projection 83 and the skeleton ring 81.